# Mapping

# Modules Roadmap: You Are Here

- NIEM Overview
- IEPD Concepts
- How NIEM uses XML (pt. 1)
- How NIEM uses XML (pt. 2)
- Business Skills
- Exchange Content Modeling
- **Mapping**
- Subsets
- Extension and Exchange Schemas
- Packaging and Distribution
- Implementation Considerations

# Objectives Roadmap

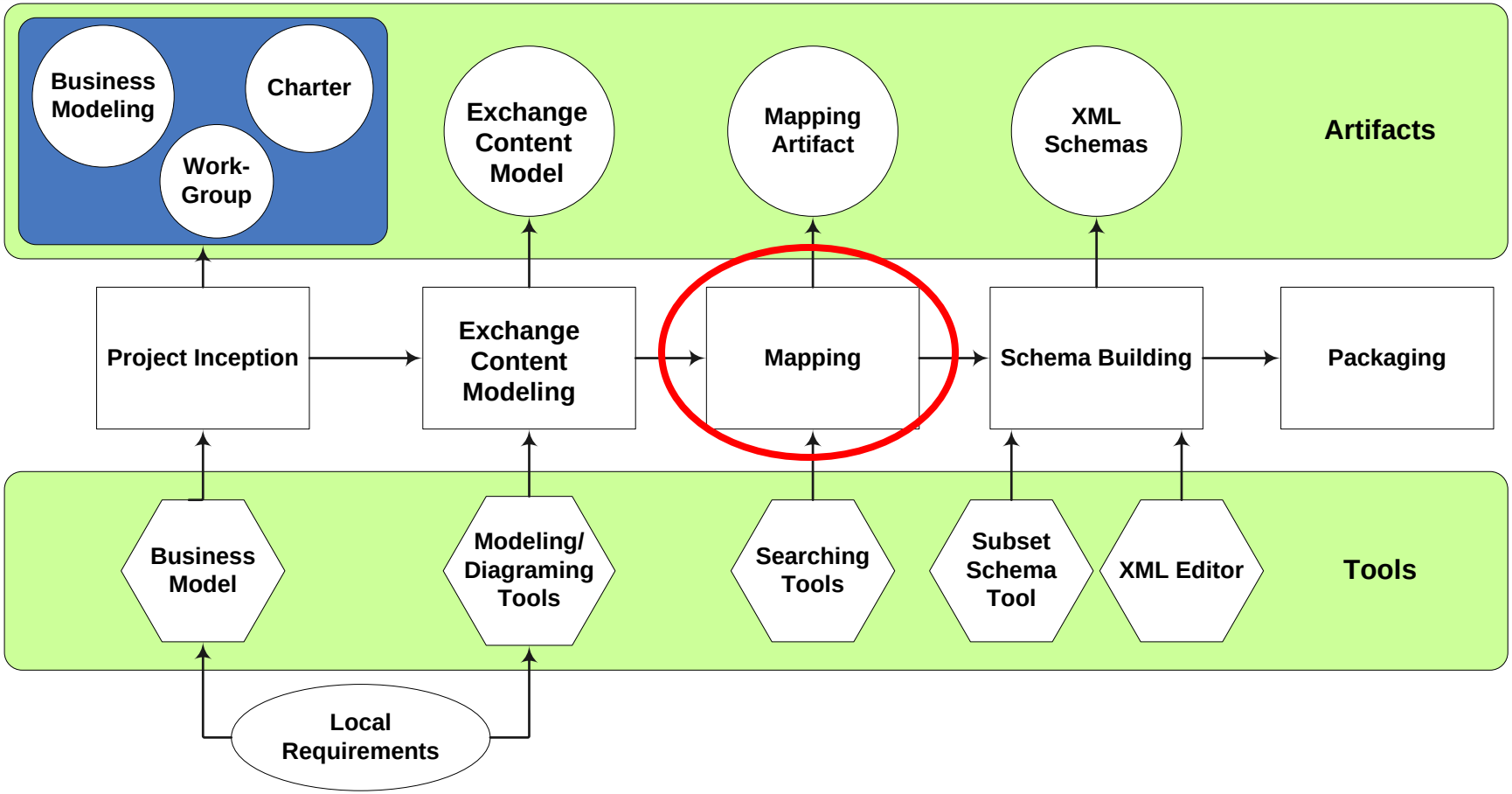
## This module supports the following course objective:

- Describe what NIEM is.
- Describe what an IEPD is.
- Comprehend artifacts included in an IEPD.
-  **Develop artifacts included in an IEPD.**
- Package an IEPD.
- Understand advanced XML concepts, as required by NIEM.
- Recognize business skills required to successfully participate in an IEPD development project.

# Module Objectives

- After completing this module, you should be able to:
  - Describe what mapping is.
  - Explain the role of mapping.
  - Recognize various mapping scenarios.
  - Create mapping artifacts.
  - Be able to map business objects to NIEM.

# Where are we now?



# What is Mapping?

- Mapping is the process of determining how your business needs map to NIEM.
- Each concept in the exchange model is mapped to objects in NIEM.
- Mapping is specific to an exchange.

# Why Map?

- Acts as a guide for implementers:
  - Determines which elements in NIEM match your business objects.
  - Identifies which elements are missing from NIEM.
  - Helps determines the structure of your exchange.

# Relates to UML *(1 of 3)*

- UML classes map to NIEM complex objects
- UML attributes map to simple NIEM objects that represent data
- UML generalizations map to NIEM type derivations
  - SSGT handles generalizations in NIEM itself
  - When extending, extend/generalize from existing NIEM types where appropriate

# Relates to UML *(2 of 3)*

- UML compositions map to NIEM inclusion.
  - NIEM uses global declarations.
  - Thus it can't capture the concept that classes cannot exist on their own.
- UML aggregations map to NIEM associations or inclusion.
  - NIEM is somewhat inconsistent.

# Relates to UML *(3 of 3)*

- UML associations map to NIEM associations and roles.
  - Occasionally to inclusion.
- UML association classes map to NIEM associations.
- UML cardinality maps to XML schema.
  - Via minOccurs and maxOccurs.
  - Applied in a constraint schema.

# Mapping "Golden Rule"

- Map concepts in your exchange model to NIEM concepts that are semantically equivalent.
- Don't map to an element that's "close enough"
  - Harder for others to understand what you meant.
  - Harder for you to understand, later on.
  - Invites corruption of data integrity over time.

# How We Document

- Simple spreadsheet
- Everyone can use a spreadsheet
- Component Mapping Template
  - Available from niem.gov
- New standardized methods of documentation are under development

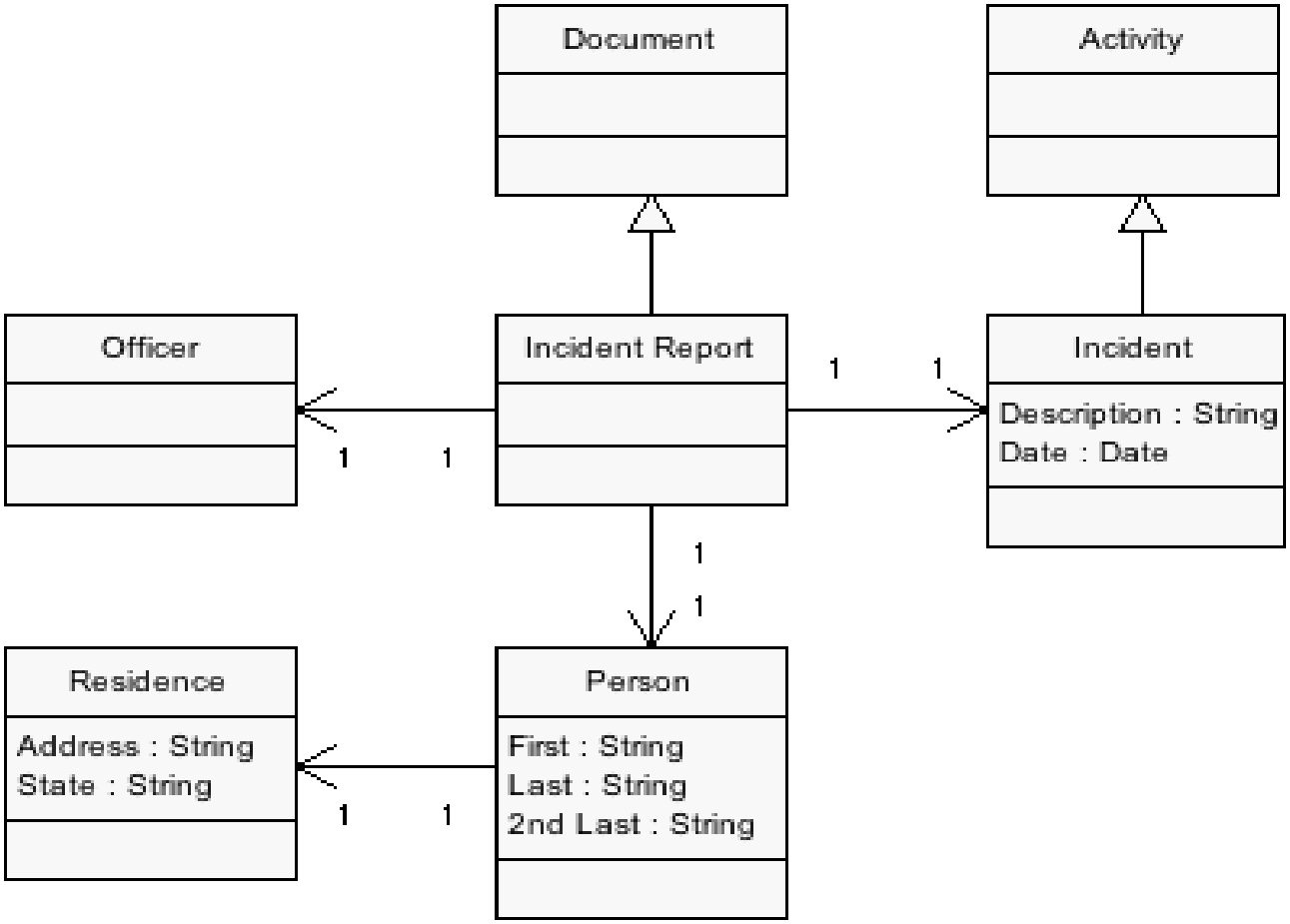
# Example Spreadsheet

| Business Class | Business Attribute | Ext? | NIEM Element | IEP Path | Notes |
|---|---|---|---|---|---|
| Person | | | nc:Person | nc:Person | |
| Person | First Name | | nc:PersonGivenName | nc:Person/ nc:PersonName/ nc:PersonGivenName | |
| Person | Last Name | | nc:PersonSurName | nc:Person/ nc:PersonName/ nc:PersonSurName | |

# Methodology

- Top-down
  - Start with the “root” concept, then work your way down to smaller concepts.
- Bottom-up
  - Start with the simplest concepts (data types) and then collect them together, working up.
- Hybrid
  - Start with large concepts, like people and locations, then work down, then group together.

# Walkthrough



# Define Root

- Defines the top-level container
- Is usually derived from **nc:DocumentType**

| Business Class | Business Attribute | Ext? | NIEM Element | IEP Path | Notes |
|---|---|---|---|---|---|
| Incident Report | | E | local-ns:Incident Report | /local-ns:Incident Report | Extends nc:Document Type |

# Easy Matches *(1 of 2)*

- Many things match easily:
  - Common objects like people and places
    - Person = nc:Person
    - First Name = nc:PersonGivenName
    - Last Name = nc:PersonSurName
- Even easy matches may have a more complicated structure.

# Easy Matches *(2 of 2)*

- Don’t miss structural pieces

| Business Class | Business Attribute | Ext? | NIEM Element | IEP Path | Notes |
|---|---|---|---|---|---|
| Person | | | nc:Person | nc:Person | |
| Person | First Name | | nc:PersonGivenName | nc:Person/ nc:PersonName/ nc:PersonGivenName | |
| Person | Last Name | | nc:PersonSurName | nc:Person/ nc:PersonName/ nc:PersonSurName | |

Needed container

Needed container

# Difficult Matches

- Some matches are difficult
  - May use different terminology
    - Police Officer = j:EnforcementOfficial
  - May be more than one match
    - Residence = Location?
    - Or is there something better, like nc:ResidenceAssociation?
  - May be multiple options
    - Many different State tables
  - May be contextual
    - Incident Date = nc:ActivityDate, in the context of an Incident

# No Match *(1 of 2)*

- Some things just aren't in NIEM.
  - May be local in nature, inappropriate for a national model.
    - Local code tables
  - May have just been missed.
    - Missing concepts should be communicated back to the NIEM community for possible inclusion in future updates of the model.

# No Match *(2 of 2)*

| Business Class | Business Attribute | Ext? | NIEM Element | IEP Path | Notes |
|---|---|---|---|---|---|
| Person | | | nc:Person | nc:Person | |
| Person | First Name | | nc:PersonGivenName | nc:Person/ nc:PersonName/ nc:PersonGivenName | |
| Person | Last Name | | nc:PersonSurName | nc:Person/ nc:PersonName/ nc:PersonSurName | |
| Person | Secondary Last Name | E | local-ns:Secondary SurName | nc:Person/ nc:PersonName/local-ns:Secondary SurName | of nc: Person Name Text Type |

New element

# Dealing With Cascades *(1 of 2)*

- If using Concrete Type Extension, must deal with cascading extensions.
- Container for the new element must also be extended to include it.
- Container for the container must be extended to include the container.
- And so on up to the root.

# Dealing With Cascades *(2 of 2)*

| Business Class | Business Attribute | Ext? | NIEM Element | IEP Path | Notes |
|---|---|---|---|---|---|
| Person | | E | local-ns:Person | local-ns:Person | Extended to hold Person Name |
| Person | First Name | | nc:PersonGivenName | local-ns:Person/ local-ns:PersonName/ nc:PersonGivenName | |
| Person | Last Name | | nc:PersonSurName | local-ns:Person/ local-ns:PersonName/ nc:PersonSurName | |
| Person | Secondary Last Name | E | local-ns:Secondary SurName | local-ns:Person/ local-ns:PersonName/ local-ns:Secondary SurName | of nc: Person Name Text Type |

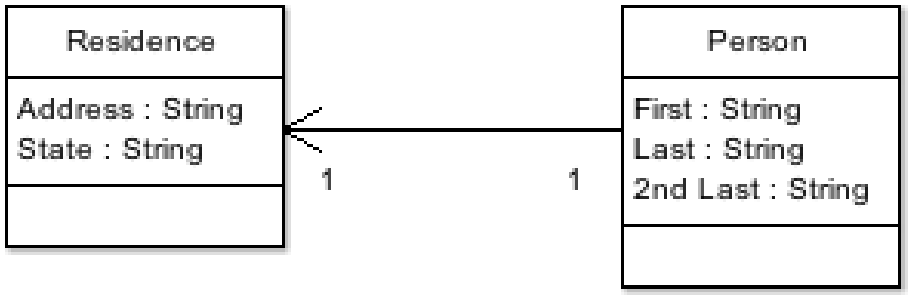
New containers

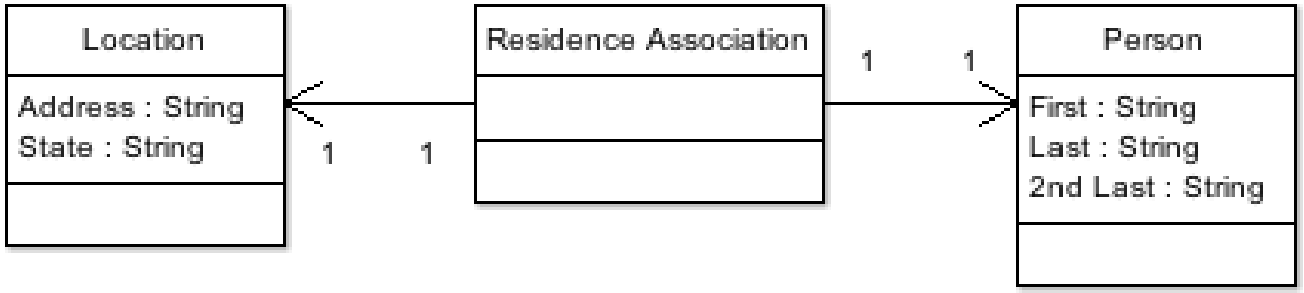
New containers

New containers

# Associations and Roles *(1 of 2)*

- Multiple ways to show associations/roles



# Associations and Roles *(2 of 2)*

| Business Class | Business Attribute | Ext? | NIEM Element | IEP Path | Notes |
|---|---|---|---|---|---|
| Residence | | | nc:Residence Association | nc:ResidenceAssociation | |
| Residence | Ref to the Location | | nc:LocationReference | nc:ResidenceAssociation /nc:LocationReference | Points to an ID |
| Residence | Ref to the Person | | nc:PersonReference | nc:ResidenceAssociation /nc:PersonReference | Points to an ID |
| Location | | | nc:Location | nc:Location | Has an ID |

# Case Study

NIEM Practical Implementer's Course

# Case Study

- Exchange Content Model Mapping Exercise
  - Use the template ExchangeModelMapping-Citation.xls in the Templates folder

Exchange Model
Mapping Templat

# Case Study Solution

- Exchange Model Mapping Exercise Solution

Exchange Model
Mapping Solution

# Module Summary

- After completing this module, you should be able to:
  - Describe what mapping is.
  - Explain the role of mapping.
  - Recognize various mapping scenarios.
  - Create mapping artifacts.
  - Be able to map business objects to NIEM.

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